

Ecological site R109XY008MO Till Backslope Savanna

Last updated: 7/02/2024
Accessed: 05/11/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.



Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 109X—Iowa and Missouri Heavy Till Plain

The Iowa and Missouri Heavy Till Plain is an area of rolling hills interspersed with interfluvial divides and alluvial valleys. Elevation ranges from about 660 feet (200 meters) along the lower reaches of rivers, to about 980 feet (300 meters) on stable interfluvial summits in southern Iowa. Relief is about 80 to 160 feet (25 to 50 meters) between major streams and adjacent interfluvial summits. Most of the till plain drains south to the Missouri River via the Grand and Chariton River systems, but the northeastern portion drains southeast to the Mississippi River. Loess caps the pre-Illinoian aged till on interfluvial divides, whereas the till is exposed on side slopes. Mississippian aged limestone and Pennsylvanian aged sandstone and shale crop out on lower slopes in some areas.

Classification relationships

Terrestrial Natural Community Type in Missouri (Nelson, 2010):

The reference state for this ecological site is most similar to a Dry-Mesic Loess/Glacial Till Savanna.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):

The reference state for this ecological site is most similar to *Quercus macrocarpa* - (*Quercus alba*, *Quercus stellata*) / *Andropogon gerardii* Wooded Herbaceous Vegetation (CEGL002159).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
 This ecological site occurs in many Land Type Associations, primarily within the following Subsections:
 Chariton River Hills
 Claypan Till Plains
 Grand River Hills
 Wyaconda River Dissected Till Plains

Ecological site concept

NOTE: This is a “provisional” Ecological Site Description (ESD) that is under development. It contains basic ecological information that can be used for conservation planning, application and land management. As additional information is collected, analyzed and reviewed, this ESD will be refined and published as “Approved”.

Till Backslope Savannas are widespread in the northern part of the MLRA. They are on steep, dissected slopes. Soils are very deep, with dense till subsoils that are mainly clay loam. The reference plant community is savanna with scattered bur oak, single oak, post oak, American hazelnut, prairie willow and wild plum, shrubs, and a ground flora of grasses such as big bluestem, little bluestem, Indiangrass, switch grass, and eastern gamagrass, and a wide variety of prairie wildflowers.

Associated sites

F109XY030MO	Loamy Floodplain Forest Loamy Floodplain Forests and other floodplain ecological sites are downslope.
R109XY006MO	Till Upland Prairie Till Upland Prairies are upslope on prairie landscapes, on gently sloping upper backslopes.
R109XY023MO	Shallow Limestone Backslope Glade/Woodland In some places, Shallow Limestone Backslope Glade/Woodland sites occur downslope, on steep lower backslopes.
R109XY046MO	Till Upland Savanna Till Upland Savannas are upslope, on gently sloping upper backslopes.

Similar sites

R109XY046MO	Till Upland Savanna Till Upland Savannas are similar in composition and structure and are usually adjacent Till Backslope Savannas but occur higher on the landscape.
-------------	---

Table 1. Dominant plant species

Tree	(1) <i>Quercus macrocarpa</i>
Shrub	(1) <i>Ceanothus americanus</i> (2) <i>Prunus americana</i>
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Schizachyrium scoparium</i>

Physiographic features

This site is on upland backslopes, with slopes of 14 to 35 percent. The site receives runoff from upslope summit and shoulder sites, and generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Minor & Davis, 1983) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites of the uplands and adjacent floodplains. The site is within the area labeled “3”, and is typically downslope from the Till Upland Savanna ecological site on upper slopes. In some areas, Shale or Limestone ecological sites are downslope, as in this figure. In other areas this site is directly above an Upland Drainageway or Floodplain ecological site.

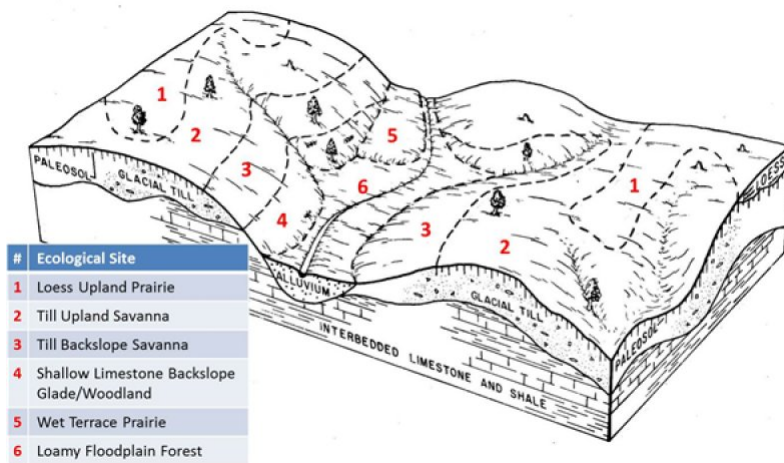


Figure 2. Landscape relationships for this ecological site

Table 2. Representative physiographic features

Landforms	(1) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	650–1,350 ft
Slope	14–35%
Water table depth	24–48 in
Aspect	Aspect is not a significant factor

Climatic features

The Iowa and Missouri Heavy Till Plain MLRA has a continental type of climate marked by strong seasonality. In winter, dry-cold air masses, unchallenged by any topographic barriers, periodically swing south from the northern plains and Canada. If they invade reasonably humid air, snowfall and rainfall result. In summer, moist, warm air masses, equally unchallenged by topographic barriers, swing north from the Gulf of Mexico and can produce abundant amounts of rain, either by fronts or by convectional processes. In some summers, high pressure stagnates over the region, creating extended droughty periods. Spring and fall are transitional seasons when abrupt changes in temperature and precipitation may occur due to successive, fast-moving fronts separating contrasting air masses.

This MLRA experiences small regional differences in climates that grade inconspicuously into each other. The basic gradient for most climatic characteristics is along a line from north to south. Both mean annual temperature and precipitation exhibit fairly minor gradients along this line. Mean January minimum temperature follows the north-to-south gradient. However, mean July maximum temperature shows hardly any geographic variation in the region. Mean July maximum temperatures have a range of only two to three degrees across the region.

Mean annual precipitation varies along the same gradient as temperature – lower annual precipitation in the north, higher in the south. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages four to five times greater than January precipitation. During years when precipitation comes in a fairly normal manner, moisture is stored in the top layers of the soil during the winter and early spring, when evaporation and transpiration are low. During the summer months the loss of water by evaporation and transpiration is high, and if rainfall fails to occur at frequent intervals, drought will result. Drought directly influences ecological communities by limiting water supplies, especially at times of high temperatures and high evaporation rates. Drought indirectly affects ecological communities by increasing plant and animal susceptibility to the probability and severity of fire. Frequent fires encourage the development of grass/forb dominated communities and understories.

Superimposed upon the basic MLRA climatic patterns are local topographic influences that create topoclimatic, or microclimatic variations. For example, air drainage at nighttime may produce temperatures several degrees lower in

valley bottoms than on side slopes. At critical times during the year, this phenomenon may produce later spring or earlier fall freezes in valley bottoms. Slope orientation is an important topographic influence on climate. Summits and south-and-west-facing slopes are regularly warmer and drier, supporting more grass dominated communities than adjacent north- and-east-facing slopes that are cooler and moister that support more woody dominated communities. Finally, the cooler microclimate within a canopied forest is measurably different from the climate of a more open and warmer grassland or savanna area.

Source: University of Missouri Climate Center - <http://climate.missouri.edu/climate.php>; Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin, United States Department of Agriculture Handbook 296 - <http://soils.usda.gov/survey/geography/mlra/>

Table 3. Representative climatic features

Frost-free period (characteristic range)	142-151 days
Freeze-free period (characteristic range)	173-181 days
Precipitation total (characteristic range)	36-40 in
Frost-free period (actual range)	139-157 days
Freeze-free period (actual range)	165-185 days
Precipitation total (actual range)	36-41 in
Frost-free period (average)	147 days
Freeze-free period (average)	177 days
Precipitation total (average)	38 in

Climate stations used

- (1) RATHBUN DAM [USC00136910], Centerville, IA
- (2) MEMPHIS [USC00235492], Memphis, MO
- (3) UNIONVILLE [USC00238523], Unionville, MO
- (4) GRANT CITY [USC00233369], Grant City, MO
- (5) TRENTON [USC00238444], Trenton, MO

Influencing water features

This ecological site is not influenced by wetland or riparian water features. The water features of this upland ecological site include evapotranspiration, surface runoff, and drainage. Each water balance component fluctuates to varying extents from year-to-year. Precipitation and drainage are highly variable between years. Seasonal variability differs for each water component. Precipitation generally occurs as single day events. Evapotranspiration is lowest in the winter and peaks in the summer. The surface runoff pulse is greatly influenced by extreme events. Conversion to cropland or other high intensity land uses tends to increase runoff, but also decreases evapotranspiration. Depending on the situation, this might increase runoff discharge, and decrease baseflow in receiving streams.

Soil features

These soils have no major rooting restriction. The soils were formed under prairie vegetation, and have dark, organic-rich surface horizons. Parent material is till. They have loam surface layers, with dense subsoils that are mainly clay loam. Some soils are slightly affected by seasonal wetness. Soil series associated with this site include Armster, Gara, Purdin, and Shelby.

The accompanying picture of the Armstrong series shows a dark, organic-rich, loamy surface horizon overlying the brown clayey till. Masses of calcium carbonate are below about 110 centimeters in this profile. Picture courtesy of Kim Vinson, NRCS; scale is in centimeters.



Figure 9. Armstrong series

Table 4. Representative soil features

Parent material	(1) Till
Surface texture	(1) Loam (2) Clay loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained
Permeability class	Very slow to slow
Surface fragment cover <=3"	0–4%
Surface fragment cover >3"	0–1%
Available water capacity (0-40in)	5–7 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	4.5–7.3
Subsurface fragment volume <=3" (Depth not specified)	1–10%
Subsurface fragment volume >3" (Depth not specified)	0–4%

Ecological dynamics

Information contained in this section was developed using historical data, professional experience, field reviews, and scientific studies. The information presented is representative of very complex vegetation communities. Key indicator plants, animals and ecological processes are described to help inform land management decisions. Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

The reference plant community is characterized as oak savanna unit dominated by big bluestem¹, little bluestem, Indian grass, switch grass, eastern gamagrass and a wide variety of prairie wildflowers. Trees and shrubs such as

bur oak, post oak, shingle oak, American hazelnut, prairie willow and American plum occurred in groves or as scattered individuals throughout the grassland landscape.

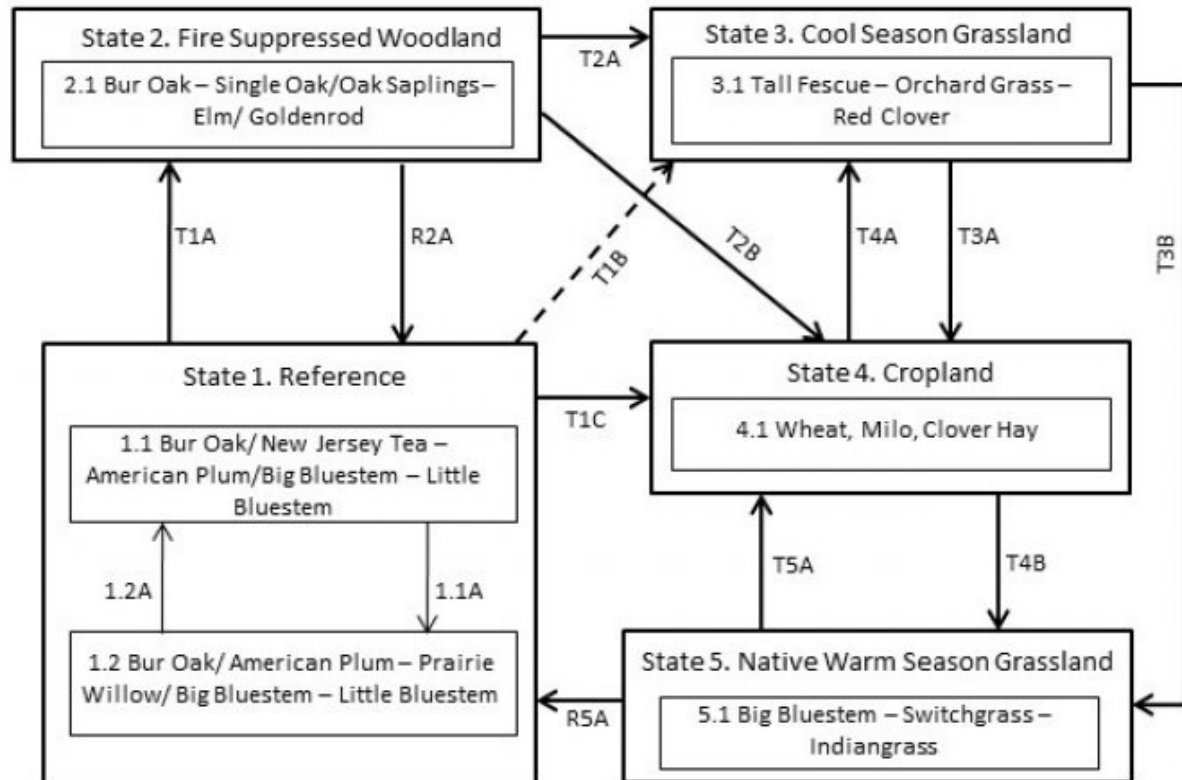
While not as typically dry and fire prone as the Claypan, Till and Loess Prairies, this ecological site still experienced fairly, frequent burns. Fire removed dead plant litter and provided room for a lush growth of prairie vegetation. Fire also kept woody species at bay. Grazing by native large herbivores, such as bison, prairie elk and white-tailed deer, also impacted these sites. Their activities altered the composition, fuel loads and structure of the vegetation, creating a diversity of structure and composition. The partially wooded draws would have burned less intensely and less frequently. During fire free intervals woody species would have increased in abundance and spread out onto the prairie.

Today, Till Backslope Savannas are nearly extirpated from the region as the former prairies and savannas have been converted to intensive agriculture. A few known remnants exist but are degraded by fire suppression and grazing by domestic livestock. While re-establishing prairie and savanna on agriculture sites is beneficial to wildlife, restoration to the reference state from agricultural land is a long term proposition with uncertain outcomes.

A State and Transition Diagram is depicted in Figure 1. Detailed descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

State and transition model

Till Backslope Savanna, R109XY008MO



Code	Event/Activity/Process
T1A	Fire suppression > 20 years; woody invasion
T1B	Tillage; vegetative seeding; grassland management
T1C, T3A, T5A	Tillage; conservation cropping system
T2A	Woody removal; tillage; vegetative seeding; grassland management
T2B	Woody removal; tillage; conservation cropping system
T4A	Vegetative seeding; grassland management
T3B, T4B	Vegetative seeding; prescribed fire; grassland management
1.1A	Fire-free interval 10+ years
1.2A	Fire interval 1-3 years
R2A	Thinning; prescribed fire 1-3 years; long rotation
R5A	Vegetative seeding; prescribed fire 1-3 years; tree planting; long rotation

Figure 10. State and transition diagram for this ecological site

State 1

Reference

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- New Jersey tea (*Ceanothus americanus*), shrub
- American plum (*Prunus americana*), shrub
- prairie willow (*Salix humilis*), shrub
- big bluestem (*Andropogon gerardii*), other herbaceous
- little bluestem (*Schizachyrium*), other herbaceous

Community 1.1

Bur Oak/ New Jersey Tea – Wild Plum/Big Bluestem – Little Bluestem

This phase is a savanna dominated by little bluestem, big bluestem and a wide variety of prairie wildflowers. Bur oak, swamp white oak, post oak, elm, American hazelnut, prairie willow and wild plum occur in small groves or as scattered individuals across the open landscape.

Forest overstory. The Forest Overstory Species list is based on commonly occurring species listed in Nelson (2010).

Forest understory. The Forest Understory list is based on commonly occurring species listed in Nelson (2010).

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- New Jersey tea (*Ceanothus americanus*), shrub
- American plum (*Prunus americana*), shrub
- big bluestem (*Andropogon gerardii*), other herbaceous
- little bluestem (*Schizachyrium*), other herbaceous

Community 1.2

Bur Oak/ Wild Plum – Prairie Willow/ Big Bluestem – Little Bluestem

This phase is similar to community phase 1.1 but oaks and shrubs are increasing due to longer periods of fire suppression. Some displacement of grasses and forbs may be occurring due to shading and competition from the increased canopy cover.

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- American plum (*Prunus americana*), shrub
- prairie willow (*Salix humilis*), shrub
- big bluestem (*Andropogon gerardii*), other herbaceous
- little bluestem (*Schizachyrium*), other herbaceous

Pathway 1.1A

Community 1.1 to 1.2

Fire-free interval 10+ years

Pathway 1.2A

Community 1.2 to 1.1

Fire interval 1-3 years

State 2

Fire Suppressed Woodland

This State is native tall grass prairie dominated by little bluestem, big bluestem and a wide variety of prairie wildflowers. This State occurs on level to gently sloping soils. In some cases, bur oak, swamp white oak, post oak, elm, American hazelnut, prairie willow and wild plum occurred in small groves or as scattered individuals across the prairie landscape. Two phases can occur that will transition back and forth depending on fire frequencies. Longer fire free intervals will allow woody species to increase such as prairie willow, dogwoods and wild plum. When fire intervals shorten these woody species will decrease. This State is rare. Most sites have been converted to cool season grassland and intensive agriculture cropland.

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- oak (*Quercus*), tree
- oak (*Quercus*), shrub
- elm (*Ulmus*), shrub
- goldenrod (*Oligoneuron*), other herbaceous

Community 2.1

Bur Oak – Single Oak/Oak Saplings – Elm/ Goldenrod

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- oak (*Quercus*), tree
- oak (*Quercus*), shrub
- elm (*Ulmus*), shrub
- goldenrod (*Oligoneuron*), other herbaceous

State 3

Cool Season Grassland

Conversion of other states to non-native cool season species such as tall fescue, orchard grass, and red clover has been common in this area. Occasionally, these sites will have scattered bur oaks. Long term uncontrolled grazing or a lack of grassland management can cause significant soil erosion and compaction and increases in less productive species such as Kentucky bluegrass and weedy forbs such as ironweed. A return to the reference state may be impossible and costly, requiring a very long term series of management options.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), other herbaceous
- orchardgrass (*Dactylis*), other herbaceous
- red clover (*Trifolium pratense*), other herbaceous

Community 3.1

Tall Fescue – Orchard Grass – Red Clover

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), other herbaceous
- orchardgrass (*Dactylis*), other herbaceous
- red clover (*Trifolium pratense*), other herbaceous

State 4

Cropland

This is a common state that exists currently with cropping of wheat or milo. Some conversion to cool season hayland occurs for a period of time before transitioning back to cropland. Limited acres are sometimes converted to native warm season grassland.

Dominant plant species

- wheat (*Triticum*), other herbaceous
- clover (*Trifolium*), other herbaceous

Community 4.1

Wheat, Milo, Clover Hay

State 5

Native Warm Season Grassland

Conversion from the Cool Season Grassland (State 3) or the Cropland (State 4) to this state is increasing due to renewed interest in warm season grasses as a supplement to cool season grazing systems or as a native restoration activity. This state is can transform back to a reference state. Substantial restoration time, money and management inputs will be needed.

Dominant plant species

- big bluestem (*Andropogon gerardii*), other herbaceous
- switchgrass (*Panicum virgatum*), other herbaceous
- Indiangrass (*Sorghastrum*), other herbaceous

Community 5.1

Native Warm Season Grassland

Dominant plant species

- big bluestem (*Andropogon gerardii*), other herbaceous
- switchgrass (*Panicum virgatum*), other herbaceous
- Indiangrass (*Sorghastrum*), other herbaceous

Transition T1A

State 1 to 2

Fire suppression >20 years; woody invasion

Transition T1B

State 1 to 3

Tillage; vegetative seeding; grassland management

Transition T1C

State 1 to 4

Tillage; conservation cropping system

Restoration pathway R2A

State 2 to 1

Thinning prescribed fire 1-3 years; long rotation

Transition T2A

State 2 to 3

Woody removal; tillage; vegetative seeding; grassland management

Transition T2B

State 2 to 4

Woody removal; tillage; vegetative seeding; grassland management

Transition T3A
State 3 to 4

Tillage; conservation cropping system

Transition T3B
State 3 to 5

Vegetative seeding; prescribed fire; grassland management

Restoration pathway T4A
State 4 to 3

Vegetative seeding; grassland management

Transition T4B
State 4 to 5

Vegetative seeding; prescribed fire; grassland management

Restoration pathway R5A
State 5 to 1

Vegetative seeding; prescribed fire 1-3 years; tree planting; long rotation

Restoration pathway T5A
State 5 to 4

Tillage; conservation cropping system

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
swamp white oak	QUBI	<i>Quercus bicolor</i>	Native	—	5–10	—	—
bur oak	QUMA2	<i>Quercus macrocarpa</i>	Native	—	5–10	—	—
post oak	QUST	<i>Quercus stellata</i>	Native	—	5–10	—	—
shingle oak	QUIM	<i>Quercus imbricaria</i>	Native	—	0–5	—	—

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
big bluestem	ANGE	<i>Andropogon gerardii</i>	Native	–	30–50
little bluestem	SCSC	<i>Schizachyrium scoparium</i>	Native	–	20–40
Indiangrass	SONU2	<i>Sorghastrum nutans</i>	Native	–	20–30
switchgrass	PAVI2	<i>Panicum virgatum</i>	Native	–	10–20
prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	Native	–	5–10
eastern gamagrass	TRDA3	<i>Tripsacum dactyloides</i>	Native	–	5–10
Forb/Herb					
Culver's root	VEVI4	<i>Veronicastrum virginicum</i>	Native	–	5–20
Virginia bunchflower	VEVI5	<i>Veratrum virginicum</i>	Native	–	5–20
wholeleaf rosinweed	SIIN2	<i>Silphium integrifolium</i>	Native	–	5–20
purple prairie clover	DAPU5	<i>Dalea purpurea</i>	Native	–	5–20
eastern purple coneflower	ECPU	<i>Echinacea purpurea</i>	Native	–	5–20
compassplant	SILA3	<i>Silphium laciniatum</i>	Native	–	5–20
hoary puccoon	LICA12	<i>Lithospermum canescens</i>	Native	–	5–20
wild bergamot	MOFI	<i>Monarda fistulosa</i>	Native	–	5–20
Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	Native	–	5–20
ashy sunflower	HEMO2	<i>Helianthus mollis</i>	Native	–	5–20
button eryngo	ERYU	<i>Eryngium yuccifolium</i>	Native	–	5–20
white wild indigo	BAAL	<i>Baptisia alba</i>	Native	–	5–20
prairie milkweed	ASSU3	<i>Asclepias sullivantii</i>	Native	–	5–20
wild quinine	PAIN3	<i>Parthenium integrifolium</i>	Native	–	5–20
butterfly milkweed	ASTU	<i>Asclepias tuberosa</i>	Native	–	5–20
prairie blazing star	LIPY	<i>Liatris pycnostachya</i>	Native	–	5–20
purple milkwort	POSA3	<i>Polygala sanguinea</i>	Native	–	5–10
Michigan lily	LIMI9	<i>Lilium michiganense</i>	Native	–	5–10
Shrub/Subshrub					
leadplant	AMCA6	<i>Amorpha canescens</i>	Native	–	5–20
prairie willow	SAHU2	<i>Salix humilis</i>	Native	–	0–10
American plum	PRAM	<i>Prunus americana</i>	Native	–	0–10
Carolina rose	ROCA4	<i>Rosa carolina</i>	Native	–	5–10
New Jersey tea	CEAM	<i>Ceanothus americanus</i>	Native	–	5–10

Animal community

Wildlife

Prairie Phase:

Game species that utilize this ecological site include:

Northern Bobwhite will utilize this ecological site for food (seeds, insects) and cover needs (escape, nesting and roosting cover).

Cottontail rabbits will utilize this ecological site for food (seeds, soft mast) and cover needs.

Turkey will utilize this ecological site for food (seeds, green browse, soft mast, insects) and nesting and brood-rearing cover. Turkey poults feed heavily on insects provided by this site type.

White-tailed Deer will utilize this ecological site for browse (plant leaves in the growing season, seeds and soft mast in the fall/winter). This site type also can provide escape cover. (Pitts and McGuire 2000)

Bird species associated with this ecological site's reference state condition:

Breeding birds as related to vegetation structure (related to time since fire, grazing, haying, and mowing) (Fitzgerald and Pashley 2000b; Jacobs 2001):

Vegetation Height Short (0.5 meter, low litter levels, bare ground visible):

Grasshopper Sparrow, Horned Lark, Upland Sandpiper, Greater Prairie Chicken, Northern Bobwhite

Mid-Vegetation Height (0.5 – 1 meter, moderate litter levels, some bare ground visible):

Eastern Meadowlark, Dickcissel, Field Sparrow, Upland Sandpiper, Greater Prairie Chicken, Northern Bobwhite, Eastern Kingbird, Bobolink, Lark Sparrow

Tall Vegetation Height (> 1 meter, moderate-high litter levels, little bare ground visible):

Henslow's Sparrow, Dickcissel, Greater Prairie Chicken, Field Sparrow, Northern Bobwhite, Sedge Wren, Northern Harrier

Brushy – Mix of grasses, forbs, native shrubs (e.g., *Rhus copallina*, *Prunus americana*, *Rubus* spp., *Rosa carolina*) and small trees (e.g., *Cornus racemosa*): Bell's Vireo, Yellow-Breasted Chat, Loggerhead Shrike, Brown Thrasher, Common Yellowthroat

Winter Resident: Short-Eared Owl, Le Conte's Sparrow

Amphibian and reptile species associated with this ecological site's reference state condition: prairies with or nearby to fishless ponds/pools (may be ephemeral) may have Eastern Tiger Salamander (*Ambystoma tigrinum tigrinum*) and Western Chorus Frog (*Pseudacris triseriata triseriata*); prairies with crawfish burrows may have Northern Crawfish Frog (*Rana areolata circulosa*); other species include Northern Prairie Skink (*Eumeces septentrionalis septentrionalis*), Ornate Box Turtle (*Terrapene ornata ornata*), Western Slender Glass Lizard (*Ophisaurus attenuatus attenuatus*), Eastern Yellow-bellied Racer (*Coluber constrictor flaviventris*), Prairie Ring-necked Snake (*Diadophis punctatus arnyi*), and Bullsnake (*Pituophis catenifer sayi*). (Johnson 2000)

Small mammals associated with this ecological site's reference state condition: Least Shrew (*Cryptotis parva*), Franklin's Ground Squirrel (*Spermophilus franklinii*), Plains Pocket Gopher (*Geomys bursarius*), Prairie Vole (*Microtus ochrogaster*), Southern Bog Lemming (*Synaptomys cooperi*), Meadow Jumping Mouse (*Zapus hudsonius*), Thirteen-lined Ground Squirrel (*Spermophilus tridecemlineatus*) and Badger (*Taxidea taxus*). (Schwartz and others 2001)

Invertebrates:

Many native insect species are likely associated with this ecological site, especially native bees, ants, beetles, butterflies and moths, and crickets, grasshoppers and katydids. However information on these groups is often lacking enough resolution to assign them to individual ecological sites.(Heitzman and Heitzman 1996)

Insect species known to be associated with this ecological site's reference state condition: Regal Fritillary butterfly (*Speyeria idalia*) whose larvae feed primarily on native prairie violets (*Viola pedata*, *V. pedatifida*, and *V. sagittata*); Mottled Dusky Wing butterfly (*Erynnis martialis*), Golden Byssus butterfly (*Problema byssus kumskaka*), Delaware Skipper butterfly (*Atryone logan logan*), and Crossline Skipper butterfly (*Polites origenes*). The larvae of the moth *Eucosma bipunctella* bore into compass plant (*Silphium laciniatum*) roots and feed and the larvae of the moth *Eucosma giganteana* bore into a number of *Silphium* species roots and feed. Native bees, important pollinators, that may be associated with this ecological site's reference condition include: *Colletes brevicornis*, *Andrena beameri*, *A. helianthiformis*, *Protandrena rudbeckiae*, *Halictus parallelus*, *Lasioglossum albipennis*, *L. coreopsis*, *L. disparilis*, *L. nymphaeum*, *Ashmeadiella buconis*, *Megachile addenda*, *Anthidium psoraleae*, *Eucera hamata*, *Melissodes coloradensis*, *M. coreopsis*, and *M. vernoniae*. The Short-winged Katydid (*Amblycorypha parvipennis*), Green Grasshopper (*Hesperotettix speciosus*) and Two-voiced Conehead katydid (*Neoconcephalus bivocatus*) are possible orthopteran associates of this ecological site.

Other invertebrate associates include the Grassland Crayfish (*Procambarus gracilis*).

Savanna Phase:

Oaks and hickories provide an important food source for many animals including White-tailed Deer, Wild Turkey, and Fox Squirrel.

Both snags and live cavity or den trees provide important food and cover for vertebrate wildlife. Snags are also very important to invertebrate species. Fox Squirrel, Red-headed Woodpecker and Eastern Bluebird utilize snags and den trees for foraging, nesting or shelter. "Wolf" trees are a particularly valuable type of live cavity tree. These large diameter, often open-grown, old-ages, hollow trees provide both cavities for wildlife and usually hard or soft mast food sources. Large diameter snags and den trees are particularly important wildlife habitat features to retain.

Game species that utilize this ecological site include:

Northern Bobwhite will utilize this ecological site for food (seeds, insects) and cover needs (escape, nesting and roosting cover).

Cottontail rabbits will utilize this ecological site for food (seeds, soft mast) and cover needs.

Turkey will utilize this ecological site for food (seeds, green browse, soft mast, insects) and nesting and brood-rearing cover. Turkey poults feed heavily on insects provided by this site type.

White-tailed Deer will utilize this ecological site for browse (plant leaves in the growing season, seeds and soft mast in the fall/winter). This site type also can provide escape cover. (Pitts and McGuire 2000)

Bird species associated with this ecological site's reference state condition (Jacobs 2001):

Breeding birds: Northern Bobwhite, Eastern Kingbird, Eastern Bluebird, Brown Thrasher, White-eyed Vireo, Prairie Warbler, Field Sparrow, Eastern Towhee, Red-headed Woodpecker, Great Crested Flycatcher, Loggerhead Shrike

Winter resident: American Tree Sparrow, Harris' Sparrow

Amphibian and reptile species likely associated with this ecological site's reference state condition: Ornate Box Turtle (*Terrapene ornata ornata*), Northern Fence Lizard (*Sceloporus undulatus hyacinthinus*), Five-lined Skink (*Eumeces fasciatus*), Western Slender Glass Lizard (*Ophisaurus attenuatus attenuatus*), Eastern Yellow-bellied Racer (*Coluber constrictor flaviventris*), Prairie Ring-necked Snake (*Diadophis punctatus arnyi*), and Rough Green Snake (*Opheodrys aestivus aestivus*). Sites containing or nearby to fishless or ephemeral ponds/pools may support the Eastern Tiger Salamander (*Ambystoma tigrinum tigrinum*). (Johnson 2000)

Small mammals likely associated with this ecological site's reference state condition: Fox Squirrel (*Sciurus niger*), Woodland Vole (*Microtus pinetorum*), Least Shrew (*Cryptotis parva*), and Indiana Bat (*Myotis sodalis*). Indiana bats utilize suitable live, dying or dead roost trees for summer habitat and raising young. Suitable roost trees typically have exfoliating or flaking bark and are larger in diameter. (Schwartz and others 2001)

Invertebrates – Many native insect species are likely associated with this phase of this ecological site's reference state condition, especially native bees, ants, beetles, butterflies and moths, and crickets, grasshoppers and katydids. However we don't have enough information on these groups to assign them to this phase of this ecological site's reference state condition at this time.

(This section developed by Mike Leahy, Natural Areas Coordinator, Missouri Department of Conservation, 2013; references for this section include: Easterla, 1962; Fitzgerald and Pashley. 2000b; Heitzman and Heitzman 1996; Jacobs 2001; Johnson 2000; Pitts and McGuire 2000; Schwartz and others 2001)

Other information

Forestry

Management: This ecological site is not recommended for traditional timber management activity. Historically this site was dominated by a ground cover of native prairie grasses and forbs. Some scattered open grown trees were also present. Alternate states may be suitable for non-traditional forestry uses such as windbreaks, environmental plantings, alley cropping (a method of planting, in which rows of trees or shrubs are interspersed with rows of crops) or woody bio-fuels.

Inventory data references

Potential Reference Sites: Till Backslope Savanna

Plot TAPRCA_KS02 – Armster soil

Located in Tarkio Prairie CA, Atchison County, MO

Latitude: 40.501588

Longitude: -95.21267

Other references

Anderson, R.C. 1990. The historic role of fire in North American grasslands. Pp. 8-18 in S.L. Collins and L.L. Wallace (eds.). Fire in North American tallgrass prairies. University of Oklahoma Press, Norman.

Brinson, M.M. 1993. A hydrogeomorphic classification for wetlands. Technical Report WRP-DE-4, U.S. Army Corps of Engineers, Engineer Waterways Experiment Station, Vicksburg, MS.

Fitzgerald, J.A. and D.N. Pashley. 2000b. Partners in Flight bird conservation plan for the Dissected Till Plains. American Bird Conservancy.

Frost, C., 1996. Pre-settlement Fire Frequency Regimes of the United States: A First Approximation. Pages 70-81, Proceedings of the 20nd Tall Timbers Fire Ecology Conference: Fire in Ecosystem Management: Shifting the Paradigm from Suppression to Prescription. Tall Timbers Research Station, Tallahassee, FL.

Heitzman, J.R. and J.E. Heitzman. 1996. Butterflies and moths of Missouri. 2nd ed. Missouri Department of Conservation, Jefferson City.

Jacobs, B. 2001. Birds in Missouri. Missouri Department of Conservation, Jefferson City.

Johnson, T.R. 2000. The amphibians and reptiles of Missouri. 2nd ed. Missouri Department of Conservation, Jefferson City.

Minor, Paul E., and Keith O. Davis. 1983. Soil Survey of Clinton County, Missouri. U.S. Dept. of Agric. Soil Conservation Service.

NatureServe. 2010. Vegetation Associations of Missouri (revised). NatureServe, St. Paul, Minnesota.

Nelson, Paul W. 2010. The Terrestrial Natural Communities of Missouri. Missouri Department of Conservation, Jefferson City, Missouri.

Nigh, Timothy A. and Walter A. Schroeder. 2002. Atlas of Missouri Ecoregions. Missouri Department of Conservation, Jefferson City, Missouri.

Pitts, D.E. and W.D. McGuire. 2000. Wildlife management for Missouri landowners. 3rd ed. Missouri Department of Conservation, Jefferson City.

Schwartz, C.W., E.R. Schwartz and J.J. Conley. 2001. The wild mammals of Missouri. University of Missouri Press, Columbia and Missouri Department of Conservation, Jefferson City.

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS). 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. 682 pgs.

Contributors

Doug Wallace

Fred Young

Approval

Suzanne Mayne-Kinney, 7/02/2024

Acknowledgments

Missouri Department of Conservation and Missouri Department of Natural Resources personnel provided significant and helpful field and technical support in the development of this ecological site.

This site was originally approved on 07/28/2015 for publication.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/11/2025
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

-
8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**
-
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**
-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**
-
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**
-
12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant:
- Sub-dominant:
- Other:
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
-
14. **Average percent litter cover (%) and depth (in):**
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
-
16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**
-
17. **Perennial plant reproductive capability:**
